CHAPTER III. SENSITIVITY OF RESULTS TO OIL PRICE ASSUMPTIONS

In Chapter II, this analysis assumed that the average price of oil delivered to U.S. refineries would be $29.70 per barrel in 1984 and remain at that level in constant dollars throughout the 1984-1990 projection period. In this chapter, the effects of changes in that oil price assumption are analyzed.

In summary, under the NGPA, the Senate bill, and the Gephardt bill, the average city-gate price of gas converges by 1990, under both high and low oil price assumptions. The NGPA and the Gephardt proposal produce similar gas prices by 1990 since the Gephardt bill would simply postpone the NGPA's decontrol provisions by two years, rather than fundamentally change natural gas pricing policy. Given higher oil prices, gas prices under the Senate bill would be somewhat lower in the mid-1980s (reflecting the bill's provisions to reorder the purchase of gas supplies) and somewhat higher in the later 1980s (reflecting the provisions that allow low-cost gas prices to rise to the oil-equivalent price). But the price increases in the Senate bill prove self-correcting by 1990 as domestic supplies expand by more than enough to eliminate the need for more costly gas imports. Rather than assuming export of this gas surplus, this analysis assumed that it would be sold in the domestic market. The resulting excess of supply over demand would act to lower prices to levels comparable to those reached under the Gephardt bill and the NGPA.

With this convergence of prices, it is not surprising to note that the effects of the Gephardt and Senate bills on the natural gas market and on the economy are generally very small, regardless of the assumed oil price. The exception to this conclusion is the effects of the two bills on the gas market under the high oil price assumption. In that case, the Senate bill would result in cumulative additions to the nation's total gas reserves of about 18 trillion cubic feet compared to the NGPA and 29 trillion cubic feet compared to the Gephardt proposal. Thus, the Senate bill would lead to significantly higher supplies should oil prices rise dramatically. If oil prices should fall, however, gas prices would follow suit under all three measures, resulting in insignificant effects on the gas market and the economy under both the Senate and Gephardt bills when compared to the NGPA. This suggests that lower oil prices, rather than the individual bill's pricing provisions, are the principal influence on the results.

OIL PRICE ASSUMPTIONS

Two alternative oil price paths were constructed for this analysis. While they are referred to as the "high" and "low" paths, they are not necessarily upper and lower bounds for oil prices over the next decade. Indeed, if the Organization of Petroleum Exporting Countries (OPEC) was to dissolve or face severe internal disarray, or if political or logistical factors compromised the security of Persian Gulf oil supplies, oil prices far lower or higher than those presented here would occur. Rather, these alternative price paths represent possible outcomes under market conditions that do not reflect either of these extreme situations.

Table 8 presents the alternate price paths. Under the high oil price path, oil prices in constant dollars rise from an average refiner's acquisition cost of $29.39 in 1983 to $32.32 in 1986, and remain level thereafter. By 1990, the current dollar price of oil reaches $47.27 per barrel. Under the low price path, prices fall in constant dollars from an average refiners' cost of $28.51 per barrel in 1983 to $21.23 in 1986, and again remain level thereafter. By 1990, the price of oil reaches $28.56 per barrel in current dollars.

TABLE 8. ALTERNATIVE OIL PRICE ASSUMPTIONS, BASED ON REFINER'S ACQUISITION COST OF CRUDE OIL
(By calendar year)

	High Oil Price		Base Oil Price		Low Oil Price	
Year	In current dollars	In constant dollars	In current dollars	In constant dollars	In current dollars	In constant dollars
1983	30.50	29.39	29.60	28.58	29.50	28.51
1984	34.50	31.64	29.70	27.59	26.50	24.88
1985	37.00	32.19	31.11	27.59	24.00	22.01
1986	39.00	32.32	32.56	27.58	24.00	21.23
1987	40.91	32.32	34.12	27.58	25.04	21.23
1988	42.91	32.32	35.75	27.58	26.14	21.23
1989	45.03	32.32	37.47	27.58	27.31	21.23
1990	47.27	32.32	39.30	27.58	28.56	21.23

SIMULATION RESULTS UNDER THE HIGH OIL PRICE CASE

As in Chapter II, the effects of the Senate and Gephardt bills are presented in the form of changes relative to a base case that reflects the provisions of the Natural Gas Policy Act (NGPA). The NGPA base case itself will change, however, if underlying oil prices change, since oil prices set a benchmark against which the price of gas competes. This section, therefore, presents a different NGPA base case reflecting higher oil prices, and then presents the effects of the Senate and Gephardt bills in the form of changes against this new, high oil price, base case. The two bills are compared to the NGPA with regard to wellhead and city-gate gas prices, natural gas market effects, and macroeconomic effects.

Gas Prices

Table 9 presents natural gas prices under the NGPA, the Senate bill, and the Gephardt bill. Since constant dollar oil prices rise under the high oil price assumption, gas prices under the NGPA follow suit, particularly upon deregulation in 1985. Constant dollar city-gate gas prices rise by 12 percent in 1985. They subsequently increase by about 1 percent per year in constant dollars until 1990.

Prices under the Senate bill are lower at both the wellhead and the city-gate in 1984 and 1985 than under the NGPA, reflecting the introduction of lower-cost supplies, as described in Chapter II. Senate prices are higher in the following three years, as the Senate bill allows older, low-cost oil to rise to oil-equivalent prices, in contrast to the NGPA, which maintains controls on this category of gas. By 1990, however, city-gate prices under the Senate bill and the NGPA are roughly equal. This parity reflects the decline in the proportion of controlled gas prices under the NGPA and the supply incentives provided by the Senate bill, which lead domestic production to increase above the amount needed to eliminate gas imports. Rather than allow this surplus gas to be exported, however, the analysis assumes the surplus gas is dedicated to the U.S. market, in which it acts to lower prices.

Long-term prices under the Gephardt bill parallel those under the NGPA, although the price increase accompanying decontrol occurs in 1987 rather than 1985. By 1990, constant dollar city-gate prices are roughly equal under the three proposals, reflecting controls in the NGPA and Gephardt cases, higher import levels under the Gephardt bill, and enough increased gas production to lower prices under the Senate bill.

TABLE 9. AVERAGE WELLHEAD AND CITY-GATE NATURAL GAS PRICES UNDER THE NGPA, THE SENATE BILL, AND THE GEPHARDT BILL, USING HIGH OIL PRICE ASSUMPTIONS (By calendar year)

Alternative	1983	1984	1985	1986	1987	1988	1989	1990	Percent Change 1983-1990
NGPA High-Oil Case									
Wellhead price (In current dollars)	2.63	2.72	3.29	3.48	3.69	3.92	4.17	4.43	68
Wellhead price (In constant dollars)	2.54	2.49	2.86	2.89	2.92	2.95	2.99	3.03	19
City-gate price (In current dollars)	4.00	4.24	5.03	5.39	5.72	6.06	6.43	6.81	70
City-gate price (In constant dollars)	3.85	3.89	4.37	4.46	4.51	4.56	4.61	4.66	21
Senate Bill									
Wellhead price (In current dollars)	2.63	2.72	3.26	3.76	4.33	4.54	4.66	4.70	79
Wellhead price (In constant dollars)	2.54	2.49	2.84	3.11	3.40	3.40	3.33	3.20	26
City-gate price (In current dollars)	4.00	4.21	4.93	5.55	6.21	6.51	6.74	6.70	68
City-gate price (In constant dollars)	3.86	3.87	4.30	4.59	4.88	4.88	4.81	4.57	19
Gephardt Bill									
Wellhead price (In current dollars)	2.63	2.30	2.49	2.62	3.70	3.88	4.07	4.26	62
Wellhead price (In constant dollars)	2.54	2.12	2.19	2.20	2.92	2.92	2.92	2.91	15
City-gate price (In current dollars)	4.00	3.76	4.15	4.41	5.80	6.11	6.45	6.79	70
City-gate price (In constant dollars)	3.85	3.47	3.65	3.70	4.58	4.60	4.63	4.64	21

Natural Gas Market Effects

The effects of the NGPA, the Senate bill, and the Gephardt bill on the natural gas market under the high oil price assumption are summarized in Table 10. Compared to the base oil price assumptions, higher oil prices raise the level of domestic production but have a minimal effect on consumption under the NGPA. Consumption is relatively unchanged because gas and oil prices rise in tandem--in fact, higher oil prices would shift some energy demand to gas, since gas prices must "catch up" to rising real oil prices. But the increase in domestic production is sufficient to lower 1990 gas imports from 2.0 trillion cubic feet, using base oil prices, to 1.3 trillion cubic feet, using high oil prices.

When combined with higher oil prices, the Senate bill's decontrol provisions lead to substantial increases in domestic production. Production rises by enough to eliminate imports and to create an exportable gas surplus in 1990. It was assumed, however, that this surplus is sold in the domestic gas market, rather than exported, thus lowering gas prices. This accounts for the falling price of gas in 1989 and 1990 under the Senate bill. Total gas reserves rise by 12.9 trillion cubic feet by 1990 when compared to their level under the NGPA when high oil prices assumed.

The controls placed on domestic prices by the Gephardt bill have the opposite effects. Domestic gas reserves in 1990 are 8.7 trillion cubic feet lower than they would be under the NGPA, but the bulk of this difference occurs in 1985 and 1986, the years in which the Gephardt bill extends controls on domestic wellhead prices beyond those specified in the NGPA. By 1990, the rate at which new gas reserves are discovered is virtually the same under the Gephardt bill and the NGPA. Because its extended controls result in lower prices, the Gephardt bill encourages gas consumption, particularly in the mid-1980s, leading to higher levels of gas imports. Gas imports in 1990 are 2.3 trillion cubic feet, almost double their estimated level under the NGPA in that year.

Macroeconomic Effects

Since the average city-price price of gas converges under the NGPA, the Senate bill, and the Gephardt bill, it is not surprising that the long-term macroeconomic differences among the three cases, presented in Table 11, are small. Higher oil prices lead to losses of real output and higher price levels under the NGPA and the two bills. The use of the high oil price assumption leads to a loss of real output (as measured by Gross Domestic Product or GDP) of about 1 percent in 1990, and cumulative inflation of between about 3 percent (as measured by the GDP deflator) to 4 percent (as

TABLE 10. NATURAL GAS MARKET FACTORS UNDER THE NGPA, THE SENATE BILL, AND THE GEPHARDT BILL, USING HIGH OIL PRICE ASSUMPTIONS (By calendar year, in trillions of cubic feet)

Alternative	1983	1984	1985	1986	1987	1988	1989	1990
NGPA High Oil Case								
Total reserves	181.0	179.0	180.0	180.0	180.0	179.0	177.0	175.0
Reserve additions	14.3	14.3	16.0	15.9	15.5	15.0	14.5	14.0
Domestic consumption	17.8	17.6	17.2	17.2	17.2	17.4	17.4	17.3
Domestic production	16.9	16.6	15.6	15.5	15.6	15.9	16.0	16.0
Gas imports a/	1.0	1.0	1.6	1.7	1.6	1.5	1.4	1.3
				Changes from the NGPA High Oil Case				
Senate Bill								
Total reserves	0	0.9	1.2	2.3	5.1	8.0	10.5	12.9
Reserve additions	0	1.0	0.8	1.8	3.5	3.8	3.8	3.7
Domestic consumption	0	0.0	0.1	0.0	-0.2	-0.3	-0.1	0.0
Domestic production	0	0.1	0.5	0.7	0.7	0.9	1.3	1.3
Gas imports a/	0	-0.1	-0.5	-0.7	-0.9	-1.2	-1.4	-1.3
Gephardt Bill								
Total reserves	0	-0.9	-3.7	-7.4	-8.5	-9.0	-8.9	-8.7
Reserve additions	0	-0.8	-2.6	-3.4	-1.4	-1.0	-0.6	-0.6
Domestic consumption	0	0.3	0.7	0.9	0.5	0.3	0.2	0.2
Domestic production	0	0.1	0.2	0.3	-0.3	-0.5	-0.7	-0.8
Gas imports a/	0	0.2	0.5	0.6	0.8	0.8	0.9	1.0

a. Changes in natural gas imports are equal to changes in natural gas consumption minus changes in natural gas domestic production. Numbers may not equal total because of rounding.

TABLE 11. MACROECONOMIC EFFECTS OF THE NGPA, THE SENATE BILL, AND THE GEPHARDT BILL, USING HIGH OIL PRICE ASSUMPTIONS (By calendar year, expressed in percentage changes in level) a/

	1983	1984	1985	1986	1987	1988	1989	1990
NGPA Low Oil Case b/								
Real gross domestic product (GDP)	-0.19	-0.69	-1.21	-1.25	-1.17	-1.13	-1.12	-1.13
GDP deflator	0.18	1.28	1.93	2.22	2.33	2.45	2.55	2.66
CPI	0.28	1.63	2.54	2.98	3.19	3.39	3.57	3.72
Changes from the NGPA High Oil Case								
Senate Bill								
Real gross domestic product (GDP)	0.0	0.02	0.06	-0.07	-0.23	-0.16	-0.09	-0.05
GDP deflator	0.0	-0.03	-0.09	0.19	0.56	0.55	0.31	-0.12
CPI	0.0	-0.03	-0.09	0.15	0.54	0.58	0.44	0.04
Gephardt Bill								
Real gross domestic product (GDP)	0.0	0.31	0.49	0.47	-0.21	-0.15	-0.08	-0.02
GDP deflator	0.0	-0.62	-1.08	-1.20	-0.01	0.02	0.04	0.03
CPI	0.0	-0.59	-1.10	-1.31	-0.22	-0.09	-0.02	0.01

a. It should be noted that these effects are presented as changes in levels, as opposed to rate of growth. This is particularly relevant in measuring inflation. An inflation effect of "x" percent in any one year means that the price level is x percent higher, not that the price level is growing x percent more rapidly. Changes in the rate of growth in the price level can be calculated by comparing the price level in any one year to its value in the previous year.

b. Expressed as changes from the estimates derived using base oil prices. Base oil prices appear in the center columns of Table 8.

measured by the CPI) under the NGPA. The effects of the Senate and Gephardt bills when measured from this base are negligible. While the Gephardt bill leads to lower price levels and real output gains in the mid-1980s, when the NGPA has already decontrolled much of the nation's gas, these effects are reversed when decontrol occurs in 1987 under the Gephardt proposal. Similarly, the Senate bill leads to higher price levels and lower real output in the late 1980s, but these losses are reversed when prices fall under the Senate bill in 1989 and 1990.

SIMULATION RESULTS UNDER THE LOW OIL PRICE CASE

Under the low oil price assumptions, oil prices fall to a level of $21.23 (in constant dollars) in 1986, and remain at that level through 1990. Under these price assumptions, oil is cheaper than gas, and continually exerts downward pressure on gas prices. The results in this section, therefore, depend on assumptions regarding gas contracts. Specifically, it is assumed that prices for controlled gas, under the Gephardt bill and the NGPA, remain at the levels specified by those measures until that gas is decontrolled, at which time they reach the oil-equivalent level. (Again, the equilibrium price of gas is taken as the heat-equivalent price of oil purchased in the manufacturing sector minus an allowance for transmission costs). Section 107 gas (high-cost gas) is phased down from a price of $4.50 in 1985 to the oil-equivalent level in equal increments over the 1985-1990 period.

One alternative assumption would have all gas prices immediately fall to the oil-equivalent level despite ubiquitous contract provisions calling for prices as high as the law allows. Such an assumption would ignore the contentious nature of renegotiation in the absence of legislated across-the-board relief. A second alternative assumption would call for pricing all gas under current contract provisions, such as those calling for wellhead price parity with the price of distillate oil or for wellhead prices equal to the average of the three highest prices found in the region. As was done in the previous chapter, prices reflecting these contract provisions were not assumed, given the chaos they would create in the gas market. Thus, the assumption used here is a middle ground between the two extremes of complete and instantaneous renegotiation and no renegotiation whatsoever.

Gas Prices

Table 12 presents wellhead and city-gate gas prices under the NGPA, the Senate bill, and the Gephardt bill, both in current and constant dollars. Average constant dollar wellhead and city-gate prices fall by 27 and 13

TABLE 12. AVERAGE WELLHEAD AND CITY-GATE NATURAL GAS PRICES UNDER THE NGPA, THE SENATE BILL, AND THE GEPHARDT BILL, USING LOW OIL PRICE ASSUMPTIONS (By calendar year)

Alternative	1983	1984	1985	1986	1987	1988	1989	1990	Percent Change 1983-1990
NGPA Low-Oil Case									
Wellhead price (In current dollars)	2.63	2.67	2.15	2.05	2.15	2.16	2.15	2.11	-20
Wellhead price (In constant dollars)	2.54	2.51	1.98	1.82	1.82	1.76	1.67	1.57	-38
City-gate price (In current dollars)	3.98	4.11	3.74	3.78	4.00	4.14	4.27	4.41	11
City-gate price (In constant dollars)	3.85	3.86	3.43	3.34	3.39	3.36	3.32	3.28	-15
Senate Bill									
Wellhead price (In current dollars)	2.63	2.29	1.93	1.83	1.85	1.92	2.00	2.08	-21
Wellhead price (In constant dollars)	2.54	2.16	1.77	1.63	1.57	1.57	1.56	1.55	-39
City-gate price (In current dollars)	3.98	3.77	3.55	3.60	3.74	3.95	4.19	4.41	11
City-gate price (In constant dollars)	3.85	3.56	3.27	3.19	3.18	3.22	3.26	3.28	-15
Gephardt Bill									
Wellhead price (In current dollars)	2.63	2.45	2.47	2.49	2.06	2.07	2.06	2.02	-23
Wellhead price (In constant dollars)	2.54	2.30	2.26	2.19	1.75	1.68	1.60	1.50	-41
City-gate price (In current dollars)	3.98	3.91	4.06	4.21	3.95	4.09	4.23	4.38	10
City-gate price (In constant dollars)	3.85	3.68	3.71	3.70	3.35	3.33	3.29	3.26	-15

percent, respectively, in 1985 under the NGPA. They continue to decline thereafter, reflecting the ongoing renegotiation of Section 107 prices. Prices under the Senate bill fall more rapidly, given the flexibility created by that bill's decontrol provisions. Following 1987, both wellhead and city-gate prices remain roughly level in constant dollars. In 1987, when the Gephardt bill's decontrol provisions go into effect, prices under that proposal fall to levels comparable to those under the NGPA and Senate bills. By 1990, both the wellhead and city-gate prices under all three cases are roughly equal.

Natural Gas Market Effects

Table 13 presents the effects of the NGPA, the Senate bill, and the Gephardt bill on natural gas markets under the low oil price assumptions.

Gas reserve and annual reserve additions are lower under the NGPA when using the low oil price assumption because lower oil, and in turn, gas prices discourage domestic exploration. Production is also lower, reflecting the lower price signals. Consumption, however, is marginally lower despite lower gas prices. This occurs because gas prices must catch up with falling oil prices. Thus, lower oil prices divert some gas demand to oil. Since the decline in production is greater than the smaller decline in consumption, gas imports increase slightly.

Since prices fall more rapidly under the Senate bill using the low oil price assumption, reserves and, in the later 1980s, domestic gas production, are slightly lower than under the NGPA. Thus, decontrol can lead to a reduced supply response if oil prices fall substantially. Moreover, gas consumption rises under the Senate bill, reflecting its lower prices. Given the higher consumption and marginally lower production levels that occur under the Senate bill, gas imports are slightly higher in this case. The Gephardt proposal has comparably small effects on the natural gas market. Reserve additions are slightly lower, as are both domestic production and consumption. Gas imports are virtually unchanged.

It should be noted that the effects of the Senate and Gephardt bills, when compared to the NGPA case, are very small when low oil prices are assumed. By 1990, the state of the gas market under the NGPA, the Senate bill, and the Gephardt bill is far more similar than it is when these three measures are compared using base or high oil price assumptions. In short, lower oil prices make the different provisions found in the three measures irrelevant. Their effects are determined largely by how flexible gas prices are. If they can fall rapidly, as they are assumed to do to varying degrees in

TABLE 13. NATURAL GAS MARKET FACTORS UNDER THE NGPA, THE SENATE BILL, AND THE GEPHARDT BILL, USING LOW OIL PRICE ASSUMPTIONS (By calendar year, in trillions of cubic feet)

Alternative	1983	1984	1985	1986	1987	1988	1989	1990
NGPA Low Oil Case								
Total reserves	182.0	179.0	178.0	176.0	174.0	171.0	168.0	165.0
Reserve additions	14.2	14.1	13.7	13.3	12.6	12.1	11.7	11.4
Domestic consumption	17.8	17.1	16.8	16.7	16.7	16.8	16.8	16.8
Domestic production	16.8	16.2	15.4	15.0	14.9	14.9	14.7	14.4
Gas imports a/	1.0	0.9	1.4	1.7	1.8	1.9	2.1	2.4
Changes from the NGPA Low Oil Case								
Senate Bill								
Total reserves	0	0.2	0.5	0.3	-0.2	-0.7	-1.1	-1.6
Reserve additions	0	0.1	0.3	-0.2	-0.5	-0.6	-0.6	-0.6
Domestic consumption	0	0.2	0.3	0.3	0.3	0.3	0.3	0.2
Domestic production	0	-0.1	0.0	0.0	0.0	-0.1	-0.2	-0.1
Gas imports a/	0	0.3	0.3	0.3	0.3	0.4	0.5	0.3
Gephardt Bill								
Total reserves	0	-0.4	-0.8	-1.2	-1.2	-1.0	-1.1	-1.4
Reserve additions	0	-0.6	-0.5	-0.6	-0.2	0.0	-0.3	-0.5
Domestic consumption	0	0.1	-0.1	-0.4	-0.2	-0.1	-0.1	0.0
Domestic production	0	-0.2	-0.1	-0.2	-0.2	-0.2	-0.2	-0.2
Gas imports a/	0	0.3	0.0	-0.2	0.0	0.1	0.1	0.2

a. Changes in natural gas imports are equal to changes in natural gas consumption minus changes in natural gas domestic production. Numbers may not equal total because of rounding.

the three measures, then they will converge at an oil-equivalent price far below the average price levels contemplated under regulation.

Macroeconomic Effects

Table 14 presents the macroeconomic effects of the NGPA under low oil prices and then shows the effects of the Senate bill and the Gephardt bill when compared to the NGPA low oil price case. Under the NGPA, lower oil prices raise real output (by about 0.5 percent in 1990) and reduce inflation (by about 6 to 7 percentage points in 1990). The macroeconomic effects of the Senate and Gephardt measures are negligible when compared to the NGPA low oil base. Once again, low oil prices, rather than the pricing provisions found in the bills, are the primary influence on these results.

TABLE 14. MACROECONOMIC EFFECTS OF THE NGPA, THE SENATE BILL, AND THE GEPHARDT BILL, USING LOW OIL PRICE ASSUMPTIONS (By calendar year, expressed in percentage changes in level) a/

	1983	1984	1985	1986	1987	1988	1989	1990
NGPA Low Oil Case b/								
Real gross domestic product (GDP)	0.0	0.32	0.88	0.81	0.59	0.47	0.45	0.47
GDP deflator	-0.11	-1.04	-3.30	-4.21	-4.62	-4.97	-5.28	-5.54
CPI	-0.08	-1.20	-3.55	-4.72	-5.37	-5.92	-6.39	-6.79
Changes from the NGPA Low Oil Base Case								
Senate Bill								
Real gross domestic product (GDP)	0	0.21	0.10	0.08	0.13	0.08	0.02	-0.02
GDP deflator	0	-0.44	-0.28	-0.26	-0.35	-0.26	-0.14	-0.03
CPI	0	-0.41	-0.31	-0.31	-0.39	-0.33	-0.22	-0.10
Gephardt Bill								
Real gross domestic product (GDP)	0	0.13	-0.21	-0.25	0.07	0.06	0.04	0.02
GDP deflator	0	-0.27	0.36	0.50	-0.05	-0.07	-0.09	-0.09
CPI	0	-0.25	0.29	0.48	0.02	-0.03	-0.07	0.08

a. It should be noted that these effects are presented as changes in levels, as opposed to rate of growth. This is particularly relevant in measuring inflation. An inflation effect of "x" percent in any one year means that the price level is x percent higher, not that the price level is growing x percent more rapidly. Changes in the rate of growth in the price level can be calculated by comparing the price level in any one year to its value in the previous year.

b. Expressed as changes from the estimates derived using base oil prices. Base oil prices appear in the center columns of Table 8.

APPENDIX

APPENDIX. NATURAL GAS REGULATORY HISTORY AND CONTRACT PROVISIONS

Understanding the effects and implications of the Senate and Gephardt bills requires some background in the history of natural gas pricing policy and in the nature of contract provisions found in the natural gas market. To assist in providing such an understanding, this appendix has been reproduced from CBO's report Natural Gas Pricing Policies: Implications for the Federal Budget (January 1983).

THE EVOLUTION OF NATURAL GAS POLICY

Natural gas regulation was established with the enactment of the Natural Gas Act of 1938 (NGA). Judicial interpretation of the NGA determined the format of subsequent federal gas regulation and the types of problems that would eventually arise under it. Knowledge of the history of federal regulation under NGA is, therefore, a necessary first step in understanding current natural gas policy issues.

The Natural Gas Act of 1938

The justification for federal intervention in the natural gas market was based on a series of Federal Trade Commission (FTC) reports that documented numerous abuses, including monopoly control over prices by pipelines in the gas market. As a result, the FTC recommended federal regulation of interstate natural gas prices. Natural gas bills were introduced in the Congress each year from 1935 to 1937, generally as proposals to regulate interstate pipelines in the same fashion as electric utilties. A bill was finally approved by the Congress and signed into law by President Roosevelt as the Natural Gas Act of 1938.

The NGA was designed to deal with pipeline monopoly in order to protect consumer interests. The act introduced the use of price ceilings for the resale of interstate gas from pipelines to consumers. These prices were calculated according to the traditional public utility method, in which prices were set to cover actual costs plus a reasonable rate of return and depreciation.

Federal Regulation Under the NGA

The Federal Power Commission (FPC), which administered the NGA, first focused its attention on the regulation of pipelines. The scope of NGA, however, was expanded in 1954 with the Supreme Court's decision in Phillips versus Wisconsin. The Court interpreted the NGA as requiring the FPC to regulate rates charged by natural gas producers and pipelines in the sale of interstate gas. Thus, the FPC was given the authority to regulate natural gas producers' wellhead prices.

Initially, the FPC attempted to set wellhead prices for producers on an individual basis. This procedure required the commission to study the rate base and operating costs of each producer in order to calculate individual cost-based prices and led to a huge backlog of cases. As a result, the FPC set producer prices for entire geographic regions based on regional average production costs and allowed rates of return. The Supreme Court upheld the concept of area-wide pricing in the Permian Basin Area Rate Case of 1968.

Recognizing a growing imbalance between natural gas supply and demand, the FPC attempted to increase price incentives for gas production. In 1974, it set a national price for gas from wells drilled on or after January 1, 1973. In addition to allowing a higher price, the FPC included an annual price escalator and excluded certain state and federal taxes and allowances from the calculation of wellhead prices.

The FPC also recognized that the interstate-intrastate market distinction had become a problem. The regulated interstate market price did not provide adequate incentive to draw supplies from the unregulated intrastate market in which prices were higher. Furthermore, interstate demand remained artificially high because the price of new, high-cost gas was averaged with old gas prices. Thus, the average price paid by consumers did not reflect the full marginal cost of new gas supplies. This disparity between intrastate and interstate demand led to gas shortages in the interstate markets during the middle 1970s. This, in turn, led the Congress to reconsider natural gas policy.

The Natural Gas Policy Act of 1978

The Natural Gas Policy Act (NGPA) of 1978 was intended to provide incentives for new production through higher prices while preventing sharp price increases for gas already in production. Consequently, the act combined deregulation and price controls by allowing phased deregulation of certain categories of newly discovered gas and by creating nationwide price

ceilings for all other gas. Also, the Federal Energy Regulatory Commission (FERC) was established to replace the Federal Power Commission.

An overview of NGPA is presented in Table A-1. As the table illustrates, the sections of NGPA can be classified into three major categories: supply incentives, consumer protection, and regulation of intrastate gas prices.

The supply incentive sections were designed to increase the nation's gas supply at the margin by allowing price increases that were rapid by historical standards and eventual deregulation. Section 102 includes gas found outside 2.5 miles of an existing well or gas found 1,000 feet below the completion depth of that well. In addition, Section 102 includes gas from outer continental shelf leases and production from new reservoirs. The price ceilings for these categories are allowed to increase at the rate of inflation plus a real growth premium. New onshore gas produced within existing fields is included in Section 103; its price increases at only the inflation rate. High-cost gas (Section 107--that is, gas that is costly to produce) includes gas from wells drilled below 15,000 feet, and gas produced from geopressurized brine, coal seams, devonian shales, and other high-cost sources. With the exception of gas produced from low-production wells (stripper wells), each of the supply incentive categories would be deregulated on January 1, 1985.

The NGPA was also designed to protect consumer interests through continued regulation of most gas already in production. Hence, the second major category of gas under NGPA includes old, low-cost natural gas. Section 104 sets the ceiling price for natural gas already dedicated to interstate commerce. The maximum lawful price in contracts that are renegotiated is determined by the provisions set forth in Section 106 of NGPA. The Section 106a price is the higher of either the price in the expiring contract or $0.54 per milion Btus, both escalating at the annual rate of inflation. Section 109 is a catch-all category. Each of these categories would not be deregulated in 1985.

The last major part of NGPA addressed the disparities between intrastate and interstate gas prices by imposing price controls on intrastate gas. For Section 105 gas, the price ceilings are tied to new gas prices (Section 102). Section 106b includes provisions for setting renegotiated intrastate prices that closely follow the methods employed in Section 106a. Some intrastate gas categories would be deregulated in 1985.

TABLE A-1. OVERVIEW OF THE NATURAL GAS POLICY ACT OF 1978

Sections	Description	Price Escalation Formula	Status as of 1/1/85
Supply Incentives			
102	New natural gas outside existing fields; new reservoirs; new outer continental shelf fields	Inflation plus real growth premium	Deregulated
103	New onshore wells within existing fields	Inflation	Deregulated
107	High-cost gas	Deregulated immediately	Deregulated
108	Stripper wells	Same as 102	Regulated
Consumer Protection			
104	Interstate gas	Same as 103	Regulated
106a	Renegotiated interstate contracts	Same as 103	Regulated
109	All other gas	Same as 103	Regulated
Intrastate Market			
105	Intrastate gas	Tied to new gas prices	Deregulated
106b	Renegotiated intrastate contracts	Same as 103	Deregulated if contract price is greater than $1.00 per thousand cubic feet

AN OVERVIEW OF CONTRACT PROVISIONS

This section provides additional information on contracts between gas producers and purchasers. The delivery of natural gas from the producer to the final user involves a large and complex network of pipelines. Each step of this process has been regulated by both federal and state regulatory authorities. In fact, under most suggested wellhead decontrol policies, including those considered in this study, the regulatory apparatus for the transmission and distribution of gas would remain in place. Therefore, the adaptability of these regulations and their influence on contract provisions, particularly those affecting producer-pipeline transactions, would be an important consideration in developing a policy to decontrol natural gas.

Contract Provisions

The sales contracts between producers and purchasers generally include four major components: duration, take-or-pay provisions, pricing provisions, and buyer-protection clauses. The following sections explain the nature of each of these provisions and present estimates of their prevalence in the natural gas market.

Contract Duration. Long-term contracts are often arranged in order to guarantee continued service and to justify capital investments in either gas turbines or pipelines. Contracts in the interstate market were historically written for 20 years or more. Long-term contracts also exist in the major intrastate markets, such as Texas and Louisiana. Recent contracts are for shorter time periods, reflecting producers' fears of being locked into fixed prices during inflationary periods. Thus, while the gas market is beginning to acquire more flexibility, the existence of long-term contracts will delay the adjustment of the gas market to new gas pricing policies.

Take-or-Pay Provisions. Take-or-pay provisions require the buyer to pay for certain quantities of gas at preset prices regardless of whether delivery occurs at the time of payment. The financial uncertainty associated with gas production is a major motivation for this provision. Because of the large cash investments required to drill and develop a well, producers often need payment for large amounts of gas during the first few years of a contract. These requirements lead producers to seek an assured market for their gas, though contracts tied to the production from a specific well or a particular field. Take-or-pay provisions are also sought by producers for protection against situations in which pipelines or other buyers could exert a disproportionate influence on prices and quantities sold once gathering equipment is in place.

Take-or-pay provisions may discourage buyers from minimizing the cost of gas. For example, a distribution company or pipeline may be forced to buy gas at a high price under a contract with a high take-or-pay provision and subsequently refuse cheaper gas or gas with a lower take-or-pay provision from another source. This phenomenon is partly attributable to the fact that profits by distribution and pipeline companies are regulated and, therefore, not influenced by any competitive bidding for gas supplies. Profits may be influenced, however, by any load loss. This problem is exacerbated since distribution companies purchase gas from pipelines at a single rate that is an average of old, low-cost gas and new, high-cost gas. Thus, this average cost pricing reduces the marketing risk associated with the purchase of high-cost gas to the extent that large volumes of low-cost gas are available.

Pricing Provisions. The pricing clauses in natural gas contracts are complex. There are three basic varieties of pricing provisions: definite escalation, highest allowed regulated-rate, and deregulation provisions. Definite escalation clauses set the price according to a fixed rate of growth or to a schedule of price increases in nominal or real dollars.

The latter two provisions set prices according to future external events, and are called indefinite escalator clauses. The highest allowed regulated-rate provision allows the producer the highest rate set by federal and state price regulations. Determining the overall price adjustments stemming from contracts that have this provision is difficult because of the uncertainty of regulatory actions. In addition, existing contracts reflect past responses to and expectations of federal and state regulation. For example, area rate clauses for both intrastate and interstate gas appeared after the adoption of area-wide, cost-based price regulation. The regulations changed again in 1974 when the Federal Power Commission adopted nationwide regulation. As a result of this change, and with the myriad of price ceilings under NGPA, the highest allowed regulated-rate provisions were written in even more general terms. Many recent contracts set prices according to the highest price allowed under current law.

Deregulation provisions are included in contracts to determine the price of gas when it is deregulated and to set the price of gas not currently regulated (such as high-cost gas under Section 107 of the NGPA). Ever since the Phillips decision in 1954, deregulation has been anticipated. Therefore, deregulation clauses were added to contracts. The most common deregulation provision sets the contract price at an average of the two or three highest prices being paid in a producing area. The price may also be the highest paid by the purchaser for similar gas sold under another contract. These options are called "most-favored-nation" clauses. Producers with

contracts containing these clauses would receive preferential treatment upon deregulation over other producers who do not have such contracts.

Many recent contracts have several pricing options in the event of deregulation. Besides the most-favored-nation clauses, natural gas prices have been tied to the price of oil, usually that of crude oil or No. 2 fuel oil (distillate oil). Pricing clauses may also be based on a fixed percentage rate of increase. When more than one pricing option appears in a contract, the seller is usually allowed to choose the price. Another form of seller protection provided in some recent contracts is the minimum-price provision that prevents the price from falling below its previous level. The combination of this provision and the most-favored-nation clauses could lead to a situation in which prices could increase sharply yet could not easily be adjusted downward in response to market forces.

Buyer Protection Provisions. While some price provisions favor high gas prices, buyer-protection clauses introduce some flexibility into the marketing of natural gas. The "market-out" and "if-disallowed" provisions are two major types of buyer-protection clauses. A market-out provision allows the buyer to refuse delivery if the gas is determined to be unmarketable at the renegotiated price. In many contracts, the conditions for determining marketability are not clearly defined. Some contracts, however, leave the determination of marketability to the discretion of the buyer. The if-disallowed provision would not allow a new price to be passed through to the buyer if the FERC or a state public utility commission determined that the price was unjustified.

Effects of Contract Provisions on Gas Supplies

This section presents estimates of the relative importance of various contract provisions on total natural gas supplies. Several surveys of existing contract provisions have recently been conducted to estimate the magnitude of the "fly-up" problem--that is, the possibility that wellhead natural gas prices will increase sharply upon decontrol and not fall in response to market forces because of rigid contract provisions.[1] The key data requirement is the amount of gas associated with each type of contract provision. For example, there may be a large percentage of contracts with deregulation provisions that have most-favored-nation clauses; yet if these contracts

---

1. The data presented in this section are from U.S. Department of Energy, Energy Information Administration, Office of Oil and Gas, Natural Gas Producer/Purchaser Contracts and Their Potential Impacts on the Natural Gas Market (June 1982).

cover only a small faction of total gas supplies, then the fly-up problem may not occur.

The prevalence of take-or-pay provisions and buyer-protection clauses is also important. For instance, if contracts with maximum-price provisions also include market-out clauses, then there would be a greater possibility that prices could fall in response to market forces. On the other hand, widespread use of take-or-pay provisions would have the opposite effect. Another important aspect is contract age. Contracts signed after passage of the NGPA have different provisions. In addition, contracts governing interstate and intrastate gas also vary because of fundamental differences in the two markets and in their regulatory histories. These distinctions imply that the following discussion can best be divided into contract provisions for old interstate gas (NGPA Sections 104 and 106a), old intrastate gas (Sections 105 and 106b), and post-NGPA gas (Sections 102, 103, 107 and 108).

Old Interstate Gas. In 1980, the volume of interstate gas under contracts signed before enactment of the NGPA was estimated to be 6.18 trillion cubic feet (approximately 31 percent of total U.S. demand), with an average wellhead price of $0.89 per thousand cubic feet. About 8 percent of this amount is governed by contracts with definite price escalators, 26 percent is covered by highest allowed regulated rate clauses, and 66 percent has deregulation provisions. Roughly 92 percent of old interstate gas supplies have take-or-pay provisions. Only 6 percent have market-out clauses, and 14 percent have renegotiated prices that can be disallowed by FERC. For the contract volumes covered by deregulation clauses, 90 percent have most-favored-nation clauses that link the price to an average of the highest priced gas in specific producing areas. Thus, based on this information, there appears to be little downward flexibility in prices for old interstate gas.

Old Intrastate Gas. The volume of old intrastate gas (Sections 105 and 106b) has been estimated at 6.23 trillion cubic feet in 1980 (approximately 32 percent of U.S. demand). The average wellhead price for this gas in 1980 was about $1.17 per thousand cubic feet. On January 1, 1985, only Section 105 gas with a price that exceeds $1.00 per million Btus would be deregulated. Rollover contracts for intrastate gas (that is, contracts that expire and are extended) are included in Section 106b. Natural gas produced under Section 106b would be deregulated in 1985 if the price exceeds $1.00 per million Btus. Roughly 28 percent of the gas volumes under Section 105 will roll over between now and 1985.

It is estimated that 34 percent of intrastate gas under Sections 105 and 106b will be deregulated in 1985. Of this amount, 51 percent have only

definite price escalator provisions. This is in sharp contrast to the 8 percent figure for old interstate gas and may reflect the fact that three-fourths of Section 105 gas is delivered under contracts signed before 1973. In addition, direct sales to final users, primarily large industrial customers, take a much larger proportion of intrastate sales. The large share of definite price escalator clauses may have been used to attract these customers. Twenty-two percent of the old intrastate gas supplies slated for decontrol in 1985 has most-favored-nation clauses. Close to 76 percent has take-or-pay provisions. Thus, prices for old intrastate gas may not increase as sharply as those for old interstate gas.

Post-NGPA Gas. Some overlap exists between contracts signed before and after the Natural Gas Policy Act of 1978. For instance, some long-term contracts have been amended to add additional wells. Consequently, a contract negotiated before enactment of the NGPA can apply to a well drilled after 1978. Recognizing this possible double counting problem, the 1980 volume of post-NGPA gas has been estimated at 6.23 trillion cubic feet (approximately 33 percent of total demand). The 1980 wellhead price for this gas was $2.19 per thousand cubic feet, considerably higher than prices for the two previously mentioned categories.

Deregulation clauses cover 59 percent of post-NGPA gas. Of these contract quantities, 76 percent have most-favored-nation clauses, 21 percent have market-out clauses, and 21 percent have oil parity price provisions. Roughly 80 percent of post-NGPA gas volumes are associated with contracts that have take-or-pay provisions. The price of post-NGPA gas, therefore, will quickly reflect any change in gas pricing policy.